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SCN2242 Chemistry 20

Module 5 Assignment

FOR STUDENT USE ONLY

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Assignment

Grading:

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Teacher

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Chemistry 20

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Module 5 **ACIDS AND BASES** *ASSIGNMENT BOOKLET*

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Lesson 1 Assignment		
Lesson 3 Assignment		
Lesson 4 Assignment		
Lesson 5 Assignment		

Teacher's Comments

Chemistry 20
Module 5: Acids and Bases
Assignment Booklet
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Students	✓
Teachers	✓
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Home Instructors	
General Public	
Other	



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MODULE 5: LESSON 1 ASSIGNMENT**Lesson 1 Assignment: Properties of Acids and Bases****Part 1: Discussion**

Name of Toy	
Summary of How the Reaction Is Used	
Explanation of Why the Reaction Is Used	
References	
Other Student Postings That Were Read	

Part 2: Lab: Testing Arrhenius's Acid-Base Definitions**Analysis**

1. Use the results of the litmus tests to categorize the solutions in the following table.

Acids	Bases	Neutral

2. Explain the purpose of testing the apparatus using distilled water before testing each of the solutions.
3. Evaluate the use of the conductivity apparatus in this experiment.
4. Some of the litmus tests took a long time to develop, such as the test for CaO(aq) . Suggest an improvement to the experimental design that would fix this problem.
5. Are there any solutions that do not seem to fit Arrhenius's theory of acids and bases? Explain.
6. Evaluate Arrhenius's theory based on the evidence gathered in this lab.

Part 3

1. For each of the following, determine whether the statement is true or false. For those that are false, write a brief sentence indicating the required correction.
 - a. The prefix *hydro-* is used to indicate that an acid has hydrogen.
 - b. A conductivity apparatus is not that useful in separating acids from bases because both solutions conduct electricity.
 - c. The hydronium ion contains a water molecule bonded to a hydrogen ion.

- d. Arrhenius's original theory of acids does not explain why compounds like carbon dioxide are acids in solution.
 - e. The modified Arrhenius theory is much better than Arrhenius's original theory at **predicting** the products of an acid reacting with water.
2. Write equations that show how each of the following substances reacts with water.
- a. Aqueous hydrogen fluoride reacts with water to form an acidic solution.
 - b. Solid sodium hydrogen sulfite reacts with water to form an acidic solution.
 - c. Solid sodium oxide, $\text{Na}_2\text{O}(\text{s})$, reacts with water to form a basic solution.
 - d. Solid sodium phosphate dissociates in water to form a basic solution.
 - e. Solid potassium hydroxide reacts with water to form a basic solution.

MODULE 5: LESSON 3 ASSIGNMENT

Lesson 3: Assignment: Strength of Acids and Bases

Part 1: Lab: Comparing Two Acids

Analysis

Use the data collected from the virtual lab to prepare a list of similarities and differences between ethanoic acid and hydrochloric acid.

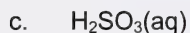
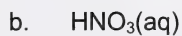
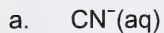
Part 2

1. Determine the hydronium-ion concentration for a solution that has a pH of 0.17.
2. A solution of perchloric acid has a concentration of 3.00×10^{-4} mol/L. Determine the pH of this solution.
3. A solution has a pOH of 4.5. Determine the hydroxide-ion concentration.
4. The concentration of hydroxide ions in a solution of strontium hydroxide is 8×10^{-2} mol/L. Determine the pOH of this solution.

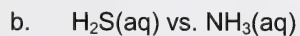
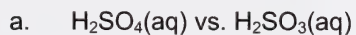
5. Compare the magnitude of the hydroxide-ion concentration of a solution that has a pOH of 2.65 with that of a second solution that has a pOH of 4.65.
6. Barium hydroxide, $\text{Ba}(\text{OH})_2(\text{aq})$, is used to clean acid spills.
- What is the classification of this solution?
 - Using a balanced chemical equation, provide a reason for your classification of $\text{Ba}(\text{OH})_2(\text{aq})$ in question 6.a.
 - On the basis of your classification, predict the result of a conductivity test for a solution containing $\text{Ba}(\text{OH})_2(\text{aq})$.
7. Oxalic acid, $\text{HOOC}\text{COOH}(\text{aq})$, is found in rhubarb leaves.
- What is the classification of this solution?
 - On the basis of your classification, predict the pH of a solution containing oxalic acid.

- c. On the basis of your classification, predict the result of a conductivity test for a solution containing oxalic acid.
- d. Write balanced chemical equations to show the ionization reactions that occur when oxalic acid is in aqueous solution.
- e. Compare the relative amount of hydronium produced by each of the ionization reactions written in question 7.d.
8. List both empirical and theoretical differences between strong and weak bases.
9. Two solutions are compared with respect to the pH:
Solution 1: 0.100-mol/L $\text{Na}_2\text{CO}_3(\text{aq})$
Solution 2: 0.100-mol/L $\text{KOH}(\text{aq})$
Explain why these two solutions will have different pH values.

10. Write balanced chemical equations that show the changes that occur when the following substances are placed in an aqueous solution. Predict the approximate pH for each resulting solution.



11. Each of the following solutions has a concentration of 0.1 mol/L. Compare the hydronium-ion concentration and pH in each pair, and explain why they are different.



12. Each of the following solutions has a concentration of 0.1 mol/L. Compare the hydroxide ion concentration and pH in each pair, and explain why they are different.

a. $\text{OCl}^-(\text{aq})$ vs. $\text{KOH}(\text{aq})$

b. $\text{Sr}(\text{OH})_2(\text{aq})$ vs. $\text{Ba}(\text{OH})_2(\text{aq})$

MODULE 5: LESSON 4 ASSIGNMENT

Lesson 4 Assignment: Multi-step pH and pOH Calculations

Part 1: The Technique of Serial Dilutions (00:00 to 04:50)

Complete the questions below for this part of the video.

1. State the purpose of this portion of the lab.
2. In the first dilution, 10.0 mL of a 1.0-mol/L solution is brought up to 100 mL with the addition of 90 mL of deionized water. Show how to calculate the new concentration.
3. Based on the results of the lab, how does colour intensity vary with the concentration of the solution?

Part 2: The Serial Dilution of HCl(aq) (04:50 to 07:55)

4. State the purpose of this portion of the lab.
5. Outline the procedure used in the serial dilutions.

6. Calculate the pH of the original 1.0-mol/L solution of HCl(aq) .

7. In the first dilution, 10.0 mL of the 1.0-mol/L HCl(aq) solution is brought up to 100 mL with the addition of 90 mL of deionized water. Show how to calculate the new pH of the solution.

8. In the second dilution, 10.0 mL of the 0.10-mol/L HCl(aq) solution is brought up to 100 mL with the addition of 90 mL of deionized water. Show how to calculate the new pH of the solution.

9. Based on your previous two calculations, predict the pH of a 0.0010-mol/L solution and a 0.000 10-mol/L solution of HCl(aq) .

10. Record the predicted pHs and the experimentally measured pHs from the lab in the following table.

11. Evaluate the results of this portion of the lab. Are all the results within the acceptable error margin of 10%?

Part 3: The Dilution of $\text{CH}_3\text{COOH}(\text{aq})$ (07:55 to 08:55)

Complete the questions below for this part of the video.

12. Is the technique used to prepare a tenfold dilution for a weak acid the same as the technique used for a strong acid?

13. In the first dilution, the measured pH is significantly different from the pH measured for the $\text{HCl}(\text{aq})$ solution of the same concentration. Account for this difference.

Part 4

1. 5.15 g of $\text{HCl}(\text{g})$, a strong acid, is dissolved in water to make a 210-mL solution. Calculate the pH of the resulting solution.

2. Calculate the mass of strontium hydroxide required to make a 450-mL solution with a pOH of 10.00.
3. A 150-mL strontium hydroxide solution with a pOH of 8.23 is diluted by adding 750 mL of water. Determine the pOH of the diluted solution.

4. 5.0 mL of 0.60 mol/L HI(aq) is mixed with 10.0 mL of water.
- Calculate the hydronium-ion concentration and pH of the resulting solution.
 - 1.0 mL of the diluted solution is added to 9.0 mL of deionized water. Predict the pH of the resulting solution.
 - Without calculating, predict the resulting pH of a solution produced by combining 1.00 mL of the solution prepared in question 4.b. with 9.0 mL of deionized water.

MODULE 5: LESSON 5 ASSIGNMENT

Lesson 5 Assignment: Indicators

Lab: Measuring pH Using Indicators

Observations

1. Show your results of this investigation on a separate piece of paper. You may submit a printout of a digital photo of the results or describe the colours of the mixtures in a data table.

Analysis

2. Use the data to estimate the pH of solutions A, B, and C. Explain how you arrived at your estimation. State a reason why using indicators only results in an estimation of the pH of the three solutions.

Once you have completed all of the questions, submit your work to your teacher.

